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File Number: T 735/89 - 3.5.2  
Application No.: 84 111 492.9  
Publication No.: 0 141 985  
Title of invention: High voltage generator

Classification: H02M 3/28

D E C I S I O N  
of 9 January 1992

Proprietor of the patent: Kabushiki Kaisha Toshiba  
Opponent: Siemens

Headword:

EPC Article 56, 102(3), Rule 29(1)

Keyword: "Inventive step - yes, after amendment"  
"Two-part form of claim appropriate"

Headnote



Case Number : T 735/89 - 3.5.2

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.2  
of 9 January 1992

**Appellant :** Siemens Aktiengesellschaft  
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**Decision under appeal :** Decision of Opposition Division of the European  
Patent Office dated 13 November 1989 rejecting  
the opposition filed against European patent  
No. 0 141 985 pursuant to Article 102(2) EPC.

**Composition of the Board :**

**Chairman :** E. Persson  
**Members :** W.J.L. Wheeler  
A. Hagenbucher

### Summary of Facts and Submissions

I. The Appellant contests the decision of the Opposition Division rejecting the Appellant's opposition filed against European patent No. 0 141 985.

II. In the statement of grounds of appeal, the Appellant referred to the prior art documents which had been cited against Claim 1 of the patent in the proceedings before the Opposition Division, namely:

R1: DE-A-2 750 544 and  
R2: US-A-4 386 395,

and argued that the subject-matter of Claim 1 of the patent as granted was known from R1, or was obvious having regard to R1 and R2.

III. In the course of the appeal proceedings, the Respondent filed amended pages 1a and 1b of description to replace page 1a of the text proposed in the communication under Rule 51(4) EPC and three differently amended versions of Claim 1, to be considered as the main request and first and second auxiliary requests. Claim 1 of the main request is worded as follows:

"1. A high voltage high power generator comprising:

a coreless transformer (1) provided with a primary winding (2) and a secondary winding (3);

switching means (5) connected between the one end of the primary winding of the transformer (1) and a first terminal of a D.C. source (4), the other end of the primary winding being connected to a second terminal of the D.C. source;

switch-driving means (6) connected to the switching means (5) to periodically control the conductive and nonconductive conditions of said switching means;

voltage resonance capacitors (7, 21) connected in parallel directly to said switching means (5) or the primary winding (2) of said transformer (1); and

a rectifier circuit (9) connected to the secondary winding (3) of said transformer (1) to rectify an output current from said secondary winding (3) for supplying a load (10)."

Claim 1 of the first auxiliary request is worded as follows:

"1. A high voltage high power generator comprising:

a transformer (1) provided with a primary winding (2) and a secondary winding (3);

switching means (5) connected between the one end of the primary winding of the transformer (1) and a first terminal of a D.C. source (4), the other end of the primary winding being connected to a second terminal of the D.C. source;

switch-driving means (6) connected to the switching means (5) to periodically control the conductive and nonconductive conditions of said switching means;

a voltage resonance capacitor (7, 21) connected in parallel directly to said switching means (5) or the primary winding (2) of said transformer (1); and

a rectifier circuit (9) connected to the secondary winding (3) of said transformer (1) to rectify an output current from said secondary winding (3) for supplying a load (10),

characterised in that the transformer (1) is a coreless transformer."

IV. The Respondent argued essentially that the claims were limited to a high voltage high power generator with a coreless transformer. "High voltage" meant a voltage between 100 and 400 kV and "high power" meant more than 100 kW, cf. column 1, lines 38 to 41 of the printed patent specification. In the D.C. - A.C. inverter disclosed in R1, the output transformer (15) had a core. Although R2 disclosed the use of a coreless transformer in a high voltage power supply, it only did so in the context of low power applications such as electrostatic air filters. If the transformer (15) of the R1 inverter were simply replaced by a coreless transformer, the resulting circuit would not work. Thus, the claimed generator did not arise from an obvious combination of R1 and R2. Arguing against the use of the two-part form of claim, the Respondent pointed out that although R1 showed a capacitor (13) connected in parallel with the primary winding of the transformer (15), there was no disclosure of the alternative connection specified in the present claims of the capacitor being in parallel with the switching means (6, 7 or 8, 9) so that R1 did not fully correspond with the prior art part of Claim 1 of the first auxiliary request. It was therefore appropriate to draft Claim 1 in one-part form (main request).

V. The Appellant requests that the decision under appeal be set aside and that the patent in suit be revoked in its entirety.

VI. It follows from the Respondent's submissions that the Respondent requests maintenance of the patent in amended form, on the following basis:

Main request

Claim 1 filed with the letter dated 12 April 1991 (received 13 April 1991) and Claims 2 to 8 as indicated in the communication under Rule 51(4) EPC;

Description, pages 1a and 1b, filed 19 November 1991 and pages 1 and 2 to 13 of the text indicated in the communication under Rule 51(4) EPC;

Drawings as indicated in the communication under Rule 51(4) EPC.

First auxiliary request

Claim 1, filed 19 November 1991;

Claims 2 to 8 and description and drawings as in the main request.

Second auxiliary request: see paragraph 5 below.

VII. Neither party has requested oral proceedings.

**Reasons for the Decision**

1. The appeal is admissible.
2. Claim 1 of the Respondent's main request differs from Claim 1 as granted in that it is now specified that the

high voltage generator is a high power generator and the connections between the capacitor, the switching means, the primary winding of the transformer and the D.C. source have been more precisely defined. The Respondent's first auxiliary request differs from the main request in that Claim 1 is in a two-part form and an obvious error has been corrected (there is only one voltage resonance capacitor in each of the described embodiments). In the opinion of the Board, both these versions of Claim 1 are acceptable as far as Article 123 (2) and (3) EPC is concerned.

3. The main question to be decided by the Board is whether the subject-matter of the patent in suit as now claimed involves an inventive step over the prior art cited by the Appellant.

3.1 The Board takes the view that the closest prior art is disclosed in DE-A-2 750 544 (R1).

3.2 R1 discloses a power supply for an X-ray tube, which counts as a high voltage high power generator within the meaning of those terms as explained in the patent in suit, see the references to X-ray tubes in column 1, lines 3 to 6 and 38 to 41. This prior art power supply comprises

a transformer (15, Fig. 1) with a primary winding (14) and a secondary winding (16);

switching means (6) connected between one end of the primary winding and a first terminal of a D.C. source (1, 3, 4), the other end of the primary winding being connected to a second terminal of the D.C. source;

switch-driving means (10) connected to the switching means (6) to periodically control the conductive and nonconductive conditions of said switching means;

a voltage resonance capacitor (13) connected in parallel directly to said primary winding (14); and

a rectifier circuit (17) connected to the secondary winding (16) of the transformer (15) to rectify an output current from said secondary winding for supplying a load (X-ray tube 18).

3.3 In this known apparatus, the D.C. source comprises a three-phase rectifier bridge (1) and two smoothing capacitors (3, 4) connected between respective output points of the bridge and the neutral line (5). There are two similar switching circuit branches connected between the respective output points of the bridge and the said one end of the primary winding of the transformer, each branch including a switching means (6 or 9) controlled by the switch-driving means (10). As pointed out by the Respondent, there is an inductance (7 or 8) connected in each branch between the switching means (6 or 9) and the one end of the primary winding (14). However, in the opinion of the Board, Claim 1 of the Respondent's main and first auxiliary requests does not exclude the possibility that there could be two (or more) switching circuit branches or that there could be other components, such as an inductance, connected between the switching means and the one end of the primary winding of the transformer.

3.4 The Respondent also pointed out that R1 does not disclose the possibility of connecting the voltage resonance capacitor in parallel with the switching means 6 or 9. This is true, but, in the opinion of the Board, the feature "a voltage resonance capacitor connected in



parallel directly to said switching means or the primary winding of said transformer" as recited in the claims can be anticipated by a voltage resonance capacitor connected in parallel directly to said switching means or by a voltage resonance capacitor connected in parallel directly to the primary winding of said transformer; and the latter is disclosed in R1. The fact that the claims recite specific alternatives with the word "or" instead of a single general expression covering the alternatives does not justify departing from the normally accepted practice that a citation does not have to disclose every possible variant falling within the scope of a claim in order to anticipate it. It anticipates if it discloses matter which falls within the scope of the claim. The same applies to parts of a claim.

- 3.5 Thus, in the opinion of the Board, the apparatus known from R1 has got all the features recited in paragraph 3.2 above and is, consequently, in accordance with the prior art part of Claim 1 according to the Respondent's first auxiliary request.
- 3.6 Therefore the subject-matter of Claim 1 according to the Respondent's main or first auxiliary request differs from the prior art known from R1 in that the transformer is a coreless transformer. As pointed out by the Respondent, this implies certain other differences in the circuit parameters, since merely replacing the transformer (15) by a coreless one without adapting the rest of the circuit would not result in a properly functioning circuit. The use of a coreless transformer reduces the size and weight of the apparatus.
- 3.7 The Appellant contends that it would be obvious to a person skilled in the art who was trying to reduce the size and weight of the apparatus known from R1 to use a

coreless transformer, since it was already known from US-A-4 386 395 (R2) to use a coreless transformer in a high voltage power supply.

3.8 R2 discloses with reference to its Figures 1 and 3 a power supply for electrostatic apparatus comprising

a coreless transformer (34, Fig. 3) provided with a primary winding (32) and a secondary winding (64);

switching means (44) connected between one end of the primary winding of the transformer and a first terminal (38) of a D.C. source, the other end of the primary winding being connected to a second terminal (28) of the D.C. source;

switch-driving means (52, Fig. 1) connected to the switching means (44) to periodically control the conductive and nonconductive conditions of said switching means;

a capacitor (36, Fig. 3) connected in parallel with the series combination of the switching means (5) and the primary winding (32) of said transformer (34); and

a rectifier circuit (72) connected to the secondary winding (64) of the transformer (34) to rectify an output current from said secondary winding for supplying a load.

3.9 The coreless transformer version of the apparatus known from R2 is only suitable for low power applications, as is made clear in column 3, lines 19 to 22, where it is said: "The high voltage pulse transformer 34 includes a secondary winding 64 that can be air coupled to the primary winding 32, the transformer 34 not requiring a ferromagnetic core in many low power applications." In

column 5, lines 9 to 36 it is again explained that for many applications of low power requirements, the high voltage transformer may be coreless. Far from there being any hint in R2 that a coreless transformer could be used in high power applications, the underlying assumption in R2 appears to be that it could not be. Another difference between the prior art known from R2 and the presently claimed subject-matter is that the capacitor shown in Fig. 3 of R2 cannot be reasonably regarded as "a voltage resonance capacitor connected in parallel directly to said switching means or the primary winding of said transformer" as recited in Claim 1 of the Respondent's first auxiliary request.

- 3.10 In the opinion of the Board, if a person skilled in the art who was trying to reduce the size and weight of the high voltage high power generator known from R1 consulted R2, he would not get the idea that it was worth trying to use a coreless transformer for high power applications such as X-ray tubes.
- 3.11 Thus, in the opinion of the Board, the high voltage high power generator according to Claim 1 of the Respondent's main and first auxiliary request involves an inventive step over the cited prior art references R1 and R2. The same applies to the dependent Claims 2 to 8, which concern specific embodiments of the high voltage generator according to Claim 1.
4. Turning now to the question of whether Claim 1 should be in one-part or two-part form, the Board observes that the relevant part of Rule 29(1) EPC stipulates: "Wherever appropriate, claims shall contain: (a) ... (b) ... ". According to Article 102(3) EPC, the Opposition Division (or Board of Appeal, cf. Article 111(1) EPC) decides

whether the patent as amended during the opposition proceedings meets the requirements of the EPC. In the present case, the Board decides that it is appropriate to use a two-part form of claim. As explained in paragraphs 3.2 to 3.5 above, the prior art disclosed in R1 includes nearly all of the technical features of the presently claimed subject-matter and is therefore highly relevant. The one-part form of claim according to the Respondent's main request would give a rather misleading impression that there is no close prior art and for this reason the Board does not accept it.

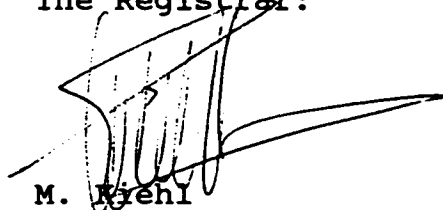
5. In the result, the Board is of the opinion that the patent, as amended according to the Respondent's first auxiliary request, and the invention to which it relates, meet the requirements of the EPC. The Respondent's second auxiliary request therefore does not need to be considered.

Order

For these reasons, it is decided that:

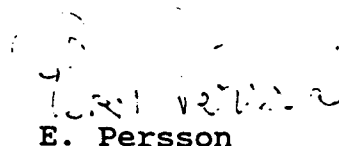
1. The decision under appeal is set aside.
2. The case is remitted to the first instance to maintain the patent in amended form according to the Respondent's first auxiliary request (see paragraph VI above).

The Registrar:



M. Kiehl

The Chairman:



E. Persson